IN THE CLAIMS:

Claims 1-125 (Canceled)

126. (Previously Presented) An apparatus for generating a map of a gemstone, and marking the gemstone with a predetermined pattern, comprising:

a marking system for directing an energy beam along an axis;

an alignment system to align the axis relative to the gemstone to define a marking position, the marking system being controlled to produce a mark on the gemstone at said marking position;

a processor for controlling the marking system and alignment system to bring the axis and the gemstone to a succession of marking positions to define the predetermined pattern; and

a mapping system for mapping the gemstone.

127. (Previously Presented) The apparatus according to claim 126, wherein the gemstone comprises a diamond.

128. (Previously Presented) The apparatus according to claim 126, wherein the marking system comprises a laser energy source.

129. (Previously Presented) The apparatus according to claim 128, wherein the laser energy source is focused to a focal point.

130. (Previously Presented) The apparatus according to claim 129, wherein the alignment system aligns the focal point with a desired marking location on the surface of the gemstone.

131. (Previously Presented) The apparatus according to claim 126, wherein the succession of marking positions are adjacent.

132. (Previously Presented) The apparatus according to claim 126, wherein the marking at the succession of marking positions produces a set of overlapping markings.

133. (Previously Presented) The apparatus according to claim 126, wherein the system for mapping the gemstone maps surface features.

134. (Previously Presented) The apparatus according to claim 126, wherein the system for mapping the gemstone maps an internal feature.

135. (Previously Presented) The apparatus according to claim 134, wherein the internal feature comprises a flaw.

136. (Previously Presented) The apparatus according to claim 126, wherein said processor controls said mapping system to map the gemstone.

137. (Previously Presented) The apparatus according to claim 126, wherein the marking pattern comprises an identification code.

138. (Previously Presented) The apparatus according to claim 126, wherein the marking pattern comprises an arbitrary inscription.

139. (Previously Presented) A method of laser marking on a gemstone surface comprising the steps of:

(a) coating the gemstone surface with a material that is capable of absorbing energy of a laser beam such that a permanent mark is formed on the gemstone surface when illuminated by a laser beam of sufficient energy, said coating absorbing laser light with higher efficiency than the gemstone surface alone; and

(b) marking the coated gemstone surface with a focused laser beam of said sufficient energy, whereby the permanent mark is formed on the gemstone.

140. (Previously Presented) The laser marking method according to claim 139, wherein said permanent mark is etched into the gemstone.

141. (Previously Presented) The laser marking method according to claim 139, wherein a laser beam of an energy in excess of said sufficient energy is required to efficiently produce a permanent mark on the gemstone in an absence of the coating.

142. (Previously Presented) The method according to claim 139, wherein the gemstone comprises a diamond.

143. (Previously Presented) The method according to claim 139, wherein said coating permits operation of said laser in a mode which would not reliably produce the permanent mark on the gemstone in the absence of the coating.

144. (Previously Presented) The method according to claim 139, wherein said marking is controlled to produce a succession of permanent marks in a predetermined pattern.

145. (Previously Presented) The method according to claim 139, further comprising the step of receiving from a user a definition of desired marking pattern.

146. (Previously Presented) The method according to claim 139, wherein the permanent mark comprises an element of an identification code.

147. (Previously Presented) The apparatus according to claim 139, wherein the permanent mark comprises an element of an arbitrary inscription.

148. (Previously Presented) The method according to claim 139, wherein the coating comprises a dye.

149. (Previously Presented) The method according to claim 139, wherein the coating comprises an ink.

150. (Previously Presented) A diamond marking attachment for a 3D diamond mapping apparatus capable of generating a map of a diamond whose surface is to be marked with a predetermined pattern and of determining a succession of marking points representing said pattern, said attachment comprising:

a laser source with its associated focusing optics for emitting a focused laser beam along an optical path;

marking position establishing system to move the optical path relative to the diamond and to thereby bring them both in a marking position, and

computer means to manipulate said marking position establishing to bring the laser beam and the diamond into said marking position successively in each of said marking point.

151. (Previously Presented) An attachment according to claim 150, wherein said marking position establishing system comprises a diamond orientation means and a beam orientation means.

152. (Previously Presented) An attachment according to claim 151, wherein said mapping apparatus has a turntable with a central axis of rotation and a top surface for the fixation thereon of said diamond, said turntable constituting said diamond orientation means.

153. (Previously Presented) An attachment according to claim 151, wherein said beam orientation system is capable of adjusting the length of said optical path and of moving said path along said central axis.

154. (Previously Presented) An attachment according to claim 153, further comprising a base with said laser source and said beam orientation system mounted therein, the base having support surfaces for mounting thereon said diamond mapping apparatus, said computer means being capable of manipulating both said apparatus and said attachment.

155. (Previously Presented) An attachment according to claim 154, wherein said beam orientation system comprises a laser displacement device for computer controlled linear displacement of said laser source with its associated focusing optics along a leading section of the optical path and thereby adjusting the length of the optical path.

156. (Previously Presented) An attachment according to claim 155, wherein said base has guides and said laser displacement device is in the form of a cartridge displaceable along said guides and carrying said laser with its focusing optics.

157. (Previously Presented) An attachment according to claim 156, wherein said base is in the form of a frame having a hollow area between said support surfaces for locating therein said laser source so as to ensure that said leading section of the optical path extends within said hollow area in a first plane oriented perpendicular to said central axis and disposed under said top surface of the turntable.

158. (Previously Presented) An attachment according to claim 157, wherein said beam orientation system further comprises optical components mounted in said base to bring the optical path from said leading section to a trailing portion lying in a second plane parallel to and located above said top surface of the turntable.

159. (Previously Presented) An attachment according to claim 158, wherein at least one of said optical components is movable along an axis parallel to said central axis.

160. (Previously Presented) An attachment according to claim 150, wherein said computer means is capable of generating appropriate position corrections whenever the diamond surface to be marked is not in its predetermined position.

161. (Previously Presented) An attachment according to claim 150, wherein said pattern is a sawing line generated by said mapping system.

162. (Previously Presented) An attachment according to claim 150, wherein said pattern is of the kind to be introduced into said mapping system by a user.

163. (Previously Presented) An attachment according to claim 162, wherein said pattern is an identification code.

164. (Previously Presented) An attachment according to claim 162, wherein said pattern is an arbitrary inscription.

165. (Previously Presented) A method of laser marking on a diamond surface comprising the steps of:

(a) coating the diamond surface with a material that is capable of interacting with a laser beam in a way that a permanent mark is etched therethrough into the diamond surface, at much lower laser power E_1 then the power E_2, that would have been required for achieving such marking directly on the diamond surface without the coating; and

(b) marking the coated diamond surface with a focused laser beam of the power E_1.

166. (Previously Presented) A method according to claim 165, wherein step (b) is performed by a diamond marking machine having a laser source of the power E_1 and capable of moving intermittently to successive points on the surface in accordance with a predetermined pattern.

167. (Currently Amended) A method according to claim 165, wherein said ~~pattern~~ marking is a ~~sawing~~ line generated ~~by~~ based on an output of said mapping system.

168. (Currently Amended) A method according to claim 165, wherein said marking comprises a pattern ~~is~~ of the kind to be introduced into said mapping system by a user.

169. (Currently Amended) A method according to claim 165, wherein said marking comprises ~~pattern is~~ an identification code.

170. (Currently Amended) A method according to claim 165, wherein said marking ~~pattern~~ is an arbitrary inscription.

171. (Previously Presented) A method of laser marking on a diamond surface comprising the steps of:

(a) coating the diamond surface with a material that is capable of interacting with a laser beam in a way that a permanent mark is etched therethrough into the diamond surface, at reduced laser intensity than the intensity that would have been required for achieving such marking directly on the diamond surface without the coating; and

(b) marking the coated diamond surface with a focused laser beam of the reduced intensity.

172. (Previously Presented) A method according to claim 171, wherein step (b) is performed by a diamond marking machine having a laser source and capable of moving intermittently to successive points on the surface in accordance with a predetermined pattern.

173. (Previously Presented) A method according to claim 171, wherein said pattern is a line generated based on a system for mapping the diamond.

174. (Previously Presented) A method according to claim 171, wherein said pattern is of the kind to be input by a user.

175. (Previously Presented) A method according to claim 171, wherein said pattern is an identification code.

176. (Previously Presented) A method according to claim 171, wherein said pattern is an arbitrary inscription.

177. (Withdrawn) A gemstone marking system, comprising:

(a) a laser, said laser generating a laser beam having a focal plane and directed to a marking surface of a gemstone;

(b) means for translating the gemstone relative to said focal plane of said laser beam;

(c) a focus sensing unit sensing relative disposition between said marking surface of the gemstone and said focal plane of said laser beam, said focus sensing unit including:

a light source emitting a collimated optical beam directed in substantially coinciding fashion with said focal plane of said laser beam and overlapping regions positioned in close proximity to said focal plane of said laser beam, and an optical detector measuring the power of said optical beam, the power of said optical beam depending on a relative disposition between said marking surface of the gemstone and said focal plane of said laser beam; and

(d) a signal processing unit operationally coupled to an output of said optical detector for receiving therefrom and processing data corresponding to the relative disposition of said marking surface of the gemstone and said focal plane of said laser beam.

178. (Withdrawn) The gemstone marking system of claim 177, wherein said signal processing unit is operationally coupled to said translating means to automatically control the position of the gemstone in response to said data received from said optical detector.

179. (Withdrawn) The gemstone marking system of claim 177, further comprising a display coupled to said signal processing unit for displaying said data obtained from said focus sensing unit.

180. (Withdrawn) The gemstone marking system of claim 177, wherein said translating means include a precision translation stage for moving the gemstone substantially in parallel with said laser beam.

181. (Withdrawn) The gemstone marking system of claim 180, further comprising a gemstone fixture for mounting the gemstone on said precision translation stage.

182. (Withdrawn) A focus sensing unit in a gemstone marking system for sensing relative disposition between a marking surface of the gemstone and a focal plane of a laser beam incident to said marking surface, said focus sensing unit comprising:

(a) a light source emitting a collimated optical beam directed in substantially coinciding fashion with said focal plane of the laser beam and overlapping regions positioned in close proximity to said focal plane of said laser beam.

(b) an optical detector coupled to said optical beam and measuring the power thereof, the power of said optical beam depending on a relative disposition between said marking surface of the gemstone and said focal plane of said laser beam, and

(c) a signal processing unit coupled to said optical detector for receiving therefrom and processing data corresponding to the relative disposition of said marking surface of the gemstone and said focal plane of said laser beam.

183. (Withdrawn) The focus sensing unit of claim 182, wherein said signal processing unit controls the position of the gemstone in response to said data.

184. (Withdrawn) The focus sensing unit of claim 182, wherein said signal processing unit outputs said data to be used by a human operator for relocating the gemstone.

185. (Withdrawn) A method for marking gemstones, comprising the steps of:

(a) generating a laser beam and directing said laser beam towards a marking surface of a gemstone;

(b) generating a collimated sensing optical beam and directing said sensing optical beam substantial coincidentally with a focal plane of said laser beam, said sensing optical beam overlapping regions positioned in close proximity to said focal plane of said laser beam;

(c) measuring the power of said sensing optical beam, the power of said sensing optical beam depending on a relative disposition between said marking surface of the gemstone and said focal plane of said laser beam;

(d) processing data corresponding to the measured power of said sensing optical beam; and

(e) changing position of the gemstone substantially to said focal plane of said laser beam in response to said processed data.

186. (Withdrawn) The method of claim 185, further comprising the step of displaying said processed data for a human operator to change the position of the gemstone.

187. (Withdrawn) The method of claim 185, wherein said changing of the position of the gemstone is performed automatically.

188. (Withdrawn) A focus sensing unit in a gemstone marking system for sensing relative disposition between a marking surface of the gemstone and a focal plane of a laser beam incident to said marking surface, said focus sensing unit comprising:

(a) a light source emitting a collimated optical beam directed in substantially coinciding fashion with said focal plane of the laser beam and overlapping regions positioned in close proximity to said focal plane of said laser beam,

(b) an optical detector coupled to said optical beam and measuring the power thereof, the power of said optical beam depending on a relative disposition between said marking surface of the gemstone and said focal plane of said laser beam, and

(c) a signal processing unit coupled to said optical detector for receiving therefrom and processing data corresponding to the relative disposition of said marking surface of the gemstone and said focal plane of said laser beam.

189. (Withdrawn) The focus sensing unit of claim 188, wherein said signal processing unit controls the position of the gemstone in response to said data.

190. (Withdrawn) The focus sensing unit of claim 188, wherein said signal processing unit outputs said data to be used by a human operator for relocating the gemstone.

191. (Withdrawn) A method for marking gemstones, comprising the steps of:

(a) generating a laser beam and directing said laser beam towards a marking surface of a gemstone;

(b) generating a collimated sensing optical beam and directing said sensing optical beam substantial coincidentally with a focal plane of said laser beam, said sensing optical beam overlapping regions positioned in close proximity to said focal plane of said laser beam;

(c) measuring the power of said sensing optical beam, the power of said sensing optical beam depending on a relative disposition between said marking surface of the gemstone and said focal plane of said laser beam;

(d) processing data corresponding to the measured power of said sensing optical beam; and

(e) changing position of the gemstone substantially to said focal plane of said laser beam in response to said processed data.

192. (Withdrawn) The method of claim 191, further comprising the step of displaying said processed data for a human operator to change the position of the gemstone.

193. (Withdrawn) The method of claim 191, wherein said changing of the position of the gemstone is performed automatically.

194. (Withdrawn) A gemstone marking system, comprising:

(a) a laser, said laser generating a laser beam having a focal plane and directed to a marking surface of a gemstone;

(b) means for translating the gemstone relative to said focal plane of said laser beam;

(c) a focus sensing unit sensing relative disposition between said marking surface of the gemstone and said focal plane of said laser beam, said focus sensing unit comprising a light source emitting an optical beam for illuminating a profile of said marking surface, and an optical detector, for measuring the power of said optical beam with respect to said marking surface, the power of said optical beam depending on a relative disposition between said marking surface of the gemstone and said focal plane of said laser beam; and

(d) a signal processing unit operationally coupled to said optical detector for receiving an output therefrom, and processing data corresponding to the relative disposition of said marking surface of the gemstone and said focal plane of said laser beam.

195. (Withdrawn) The gemstone marking system of claim 194, wherein said signal processing unit is operationally coupled to said translating means to automatically control the relative position of the gemstone to the focal plane in response to said data received from said optical detector.

196. (Withdrawn) A focus sensing unit in a gemstone marking system for sensing relative disposition between a marking surface of the gemstone and a focal plane of a laser beam incident to said marking surface, said focus sensing unit comprising:

(a) a light source emitting an optical beam directed toward said focal plane of the laser beam, and overlapping regions positioned in close proximity to said focal plane of said laser beam,

(b) an optical detector measuring said optical beam, the output of the optical detector depending on a relative disposition between said marking surface of the gemstone and said focal plane of said laser beam, and

(c) a signal processing unit coupled to said optical detector for receiving therefrom and processing data corresponding to the relative disposition of said marking surface of the gemstone and said focal plane of said laser beam.

197. (Withdrawn) The focus sensing unit according to claim 196, wherein:

(a) said light source emits a collimated optical beam directed in substantially coinciding fashion with said focal plane of said laser beam and overlapping regions positioned in close proximity to said focal plane of said laser beam; and

(b) said optical detector is coupled to said optical beam and measures the power thereof, the power of said optical beam depending on a relative disposition between said marking surface of the gemstone and said focal plane of said laser beam.

198. (Withdrawn) A method for marking gemstones, comprising the steps of:

(a) generating a laser beam and directing said laser beam towards a marking surface of a gemstone;

(b) generating a sensing optical beam and directing said sensing optical beam substantial coincidentally with a focal plane of said laser beam, said sensing optical beam overlapping regions positioned in close proximity to said focal plane of said laser beam;

(c) measuring the sensing optical beam, the measured sensing optical beam depending on a relative disposition between said marking surface of the gemstone and said focal plane of said laser beam;

(d) processing data corresponding to the measured sensing optical beam; and

(e) changing position of the gemstone substantially to said focal plane of said laser beam in response to said processed data.

199. (Withdrawn) The method of claim 198, further comprising the step of displaying said processed data for a human operator to change the position of the gemstone.

200. (Withdrawn) The method of claim 198, wherein said changing of the position of the gemstone is performed automatically.

201. (Withdrawn) The method of claim 198, wherein:

said generating step comprises generating a collimated sensing optical beam and directing said sensing optical beam substantial coincidentally with a focal plane of said laser beam, said sensing optical beam overlapping regions positioned in close proximity to said focal plane of said laser beam;

said measuring step comprises measuring the power of said sensing optical beam, the power of said sensing optical beam depending on a relative disposition between said marking surface of the gemstone and said focal plane of said laser beam; and

said processing step comprises processing data corresponding to the measured power of said sensing optical beam.